A Long History of Recognitions in Transforming Data into Knowledge:

Since 1987, Sandia National Laboratories and the Department of Energy and (later) the National Nuclear Security Administration's Advanced Simulation and Computing Program have been the proud recipients of numerous Gordon Bell Awards and recognitions—all for exhibiting leadership in applications of high performance computing: analysis, modeling and simulation.

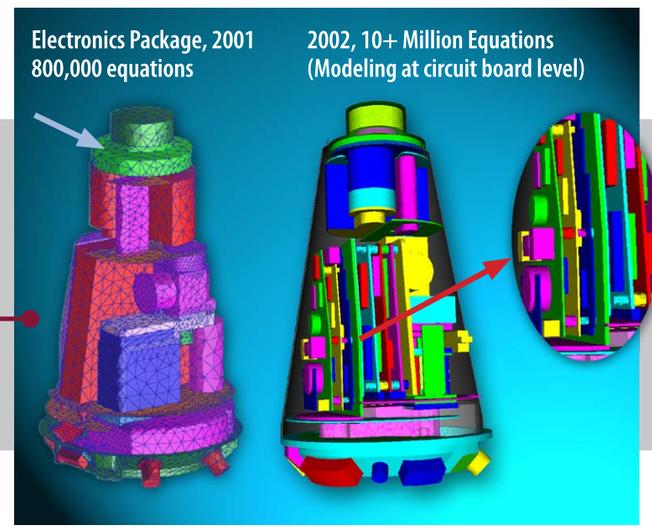
Sandia National Laboratories

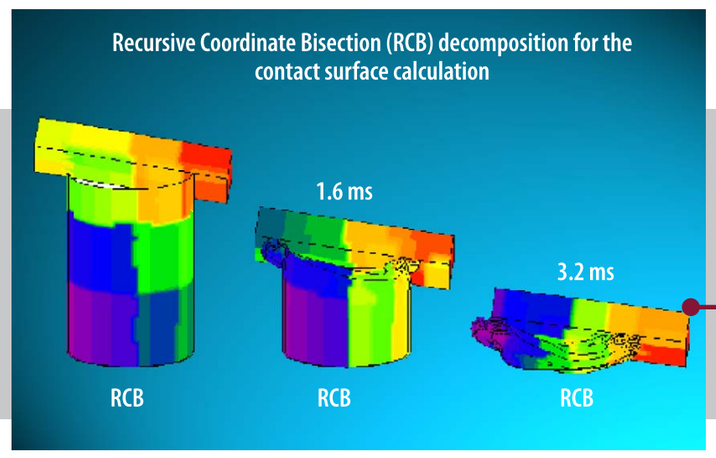
Enhancing Performance and Portability

In 2002 the Gordon Bell Prize for Special Accomplishment went to "Salinas—A Scalable Software for High Performance Structural and Solid Mechanics Simulations."—*Manoj Bhardwaj, Kendall Pierson, Garth Reese, Tim Walsh, David Day, Kenneth Alvin, James Peery, et al.*

Salinas, a scalable implicit software application is for the finite element static and dynamic analysis of complex structural real-world systems. It addressed total solution time, scalability, and overall CPU efficiency in addition to floating-point performance.

Salinas' performance was measured on ASCI White (1.16 teraFLOPS on 3,375 processors) and ASCI Red (292.5 gigaFLOPS on 2,940 processors).





Parallelizing for Scalability

In 1997, the Gordon Bell Finalist went to "Transient Solid Dynamics Simulation on the Sandia/Intel teraFLOP Computer." —*Steve Attaway, Kevin Brown, Courtenay Vaughan, David Gardner, et al.*

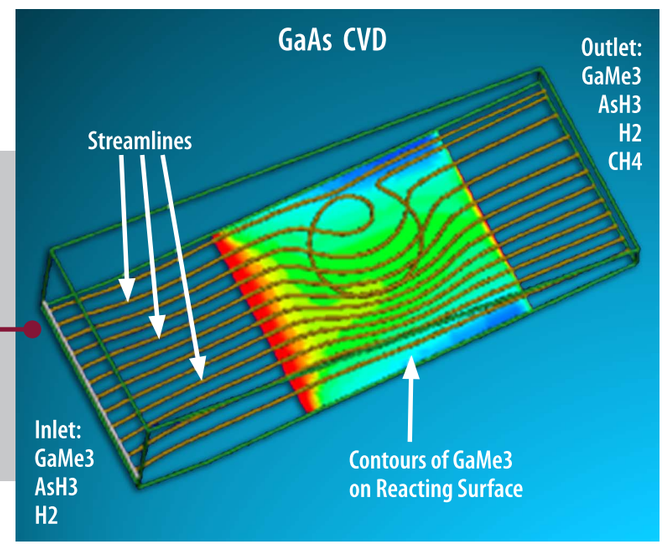
PRONTO, a transient solid dynamics code, solved a 6.5 million element can crush problem on 3500 nodes at 76 gigaFLOPS, using a newly patented parallel algorithm for material contact.

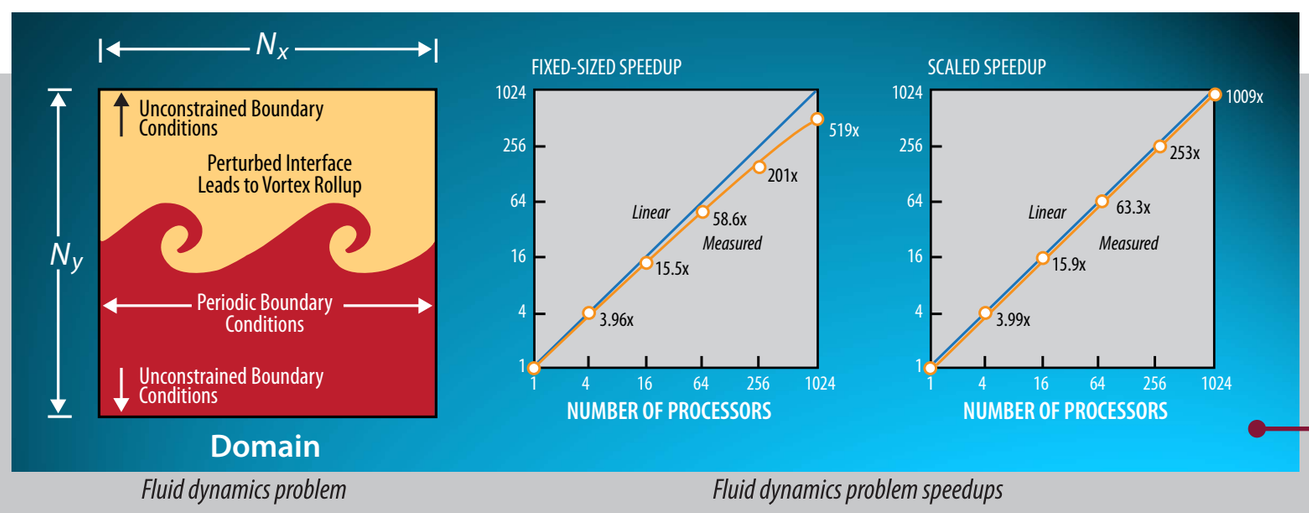
Demonstrating New High Performance Reacting Flow Applications

In 1997, the Gordon Bell Finalist went to "High Performance MP Unstructured Finite Element Simulation of Chemically Reacting Flows."
— *Karen Devine, Scott Hutchinson, Andy Salinger, John Shadid, Ray Tuminaro*

MP-SALSA achieved 212 gigaFLOPS on 3,600 processors on ASCI Red.

Large-scale parallel simulations compute the complex velocity, temperature and chemical concentration fields in this chemical vapor deposition reactor for producing advanced III-V (gallium arsenide) semiconductor materials.





Fluid dynamics problem *Fluid dynamics problem speedups*

Achieving Scaled Speedup

In 1988, the Inaugural Gordon Bell Prize Winner went to "Analysis of Scientific Application Programs on a 1024-Processor Hypercube" – *Robert Benner, Gary Montry, John Gustafson*

A 1000-fold scaled speedup was achieved on an nCUBE/ten hypercube with three 2D scientific applications: solid mechanics, fluid dynamics via flux-corrected transport, and wave mechanics.

Thanks to this winning entry, the 1988 competition was the first and only time that parallel speedup was the contest criterion.

Other Sandia National Laboratories Gordon Bell recognitions

1990 Gordon Bell Honorable Mention: "Solid Modeling on a Connection Machine" – 35 times faster than an IBM 3090 vector processor.

1994 Gordon Bell Prize Winner: "Applications of Boundary Element Methods on the Intel Paragon" – sustained performance of 99-140 GFLOPS on 3 boundary element applications: structural mechanics, acoustics, and computational electromagnetics.

1994 Gordon Bell Finalist: "A 65+ GFLOPS Unstructured Finite Element Simulation of Chemically Reacting Flows on the Intel Paragon."

1998 Gordon Bell Finalist: "Electronic Structure Calculations on ASCI Red" – 605 GFLOPS achieved for aluminum oxide surface with silicon bulk material.

2004 Gordon Bell Prize for Special Accomplishment: "Ultrascalable Implicit Finite Element Analysis in Solid Mechanics with Over Half a Billion Degrees of Freedom."

2005 Gordon Bell Finalist: "A Scalable Distributed Parallel Breadth-First Search Algorithm on BlueGene/L".

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94AL85000.

SAND 2008-7135P